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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/531,634	11/17/2005	Jae-Ho Jung	51876P840	6230

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EXAMINER	
MALEK, LEILA	

ART UNIT	PAPER NUMBER
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/531,634	JUNG ET AL.	
	Examiner	Art Unit	
	LEILA MALEK	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *18 June 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,2,4,6,7 and 10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2,4,6,7 and 10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *02 July 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *06/18/2009*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. This office action is in response to the amendments received on 06/18/2009.

Information Disclosure Statement

2. The information disclosure statement submitted on 06/18/2009 has been considered and made of record by the Examiner.

Claim Objections

3. Claim 6 is objected to because of the following informalities: as to claim 6, "the number of users" has antecedent basis problem. Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 2, 4, 6, 7, and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over background of invention further in view of Posti (US 2002/0021764).

As to claim 1, Applicants in the background of invention disclose an adaptive array antenna system (see Fig. 1), comprising: modulation mean 101 having a plurality of modulators for generating transmitting data corresponding to the number of users (see page 6, lines 36-37 - page 7, line 1); beam forming means 102 (see page 7, line 1-4) having a plurality of beam formers for generating a multiplexed data by multiplexing the generated transmitting data to a beam forming weight; vector addition means 103

for generating sum data by adding outputs of the beam forming means corresponding to a user (see page 7, lines 5-8); array error compensation means 108 for generating an error compensation coefficient of each channel (see block 106 and page 7, lines 32-37) and error compensated data, the array error compensation means multiplexing a reverse of a transfer function of an array transmitting means to the sum data from the vector addition means 103 (see page 7, lines 8-10) by using a compensation signal inputted through a frequency down conversion means 114; compensation signal extraction means 113 for extracting the compensation signal from an output signal of the array transmitting means 110 and outputting the compensation signal; the frequency down-conversion means 114 for generating the frequency down converted signal by frequency-down converting the compensation signal; the array transmitting means 110 for converting the signal from the array error compensation means to an analogue signal and frequency-up converting the analogue signal (see page 7, lines 10-13); and array antenna 115 for transmitting an output signal passed through the compensation signal extraction means 113. Applicants in the background of invention disclose all the subject matters claimed in claim 1, except for array linearization means for receiving the error compensated data from the array error compensation means, generating linearized signal by linearizing the error compensated data by using frequency down converted signal from the frequency down conversion means and transferring the linearized signal to the transmitting means, wherein the array linearization means includes non-linear coefficient extraction means for receiving an output signal of the array error compensation means, comparing the output signal and the frequency down

converted signal form the frequency down conversion means and extracting a non-linear coefficient for each channel, and pre-distortion means for linearizing the error compensated data from the array error compensation means by multiplexing the extracted non-linear coefficient to the error compensated data. Applicants in the background of invention also do not disclose that an updating period of the error compensation coefficient is faster than an updating period of the non-linear coefficients. Posti, in the same field of endeavor, shows a communication system (see Fig. 4) comprising: an array linearization means (see block 108) for receiving an input data signal (see the output of blocks 106) and generating linearized signal by linearizing the data by using frequency down converted signal (i.e. the output of channeliser 140, see also downconverter 132) from the frequency down conversion means (see downconverter 132) and transferring the linearized signal to transmitting means (see antenna 126), wherein the array linearization means includes non-linear coefficient extraction means (see Fig. 7, subtractors 202) for receiving an output signal of the modulators 106, comparing the output signal and the frequency down converted signal (see the output of channeliser 140, as explained above) form the frequency down conversion means (see multiplier 132) and extracting a non-linear coefficient for each channel (see the outputs of 202s), and pre-distortion means for linearizing the modulated data by multiplexing the extracted non-linear coefficient to the modulated data (see paragraph 0039). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Applicants' background of invention as suggested by Posti to correct the amplification distortion caused by the amplifier in the transmit path

(see paragraphs 0001-0012). Posti does not expressly disclose that the array linearization means (predistorter 108) receives the error compensated signal instead of the data signal; however since the purpose of using a pre-distorter in transmitter is only to correct the amplification distortion caused by the RF power amplifier, the position (or location) of pre-distorter in the transmitter is a matter of design choice. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Applicants in the background of invention with Posti's teachings and place the pre-distorter for instance immediately after the array error compensator to meet the design requirements of the system. Applicants' background of invention and Posti do not disclose that an updating period of error compensation coefficient is faster than an updating period of the nonlinear coefficients (i.e. calculating new non-linear coefficients as described by Posti in paragraph 0050). However, it is a matter of design choice and therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to update one set of coefficients more often than the other set to meet the design requirements and conditions of the communication system.

As to claim 2, Applicants in the background of invention further disclose that the array error compensation means 108 includes: error compensation signal generation means 104 for generating a digital error compensation signal to be injected to a channel in order to estimate the transfer function of the array transmitting means; error compensation signal injection 105 for generating digital transmitting data by adding an output vector of the vector addition means 103 and a vector of the digital error

compensation signal vector; error compensation coefficient estimation means 106 for estimating the error compensation coefficient of each channel by considering relation between the compensation signal from the frequency down conversion means 114 and the error compensated signal generated from the error compensation signal generation means 104; and error compensation means 107 for multiplexing a reverse of the error compensation coefficient to the digital transmitting data (see page 7, lines 8-10) generated from the error compensation signal injection means 105 in each transmitting channel of the array transmitting means 110 and transferring a result of the multiplexing to the array transmitter means.

As to claim 6, Applicants in the background of invention disclose a linearization method comprising the steps of: generating a transmitting signal corresponding to a number of users (see Fig. 1, block 101 ,and page 6 last paragraph); generating multiplexed data by multiplexing the transmitting data with a beam forming weight (see beam-formers 102 and page 7, lines 104); c) generating sum data (see 103) by adding the multiplexed data; d) generating an error compensation coefficient of each channel (see block 106 and page 7, last paragraph) and error compensated data (see block 107), the error compensated data being generated by compensating a frequency down converted signal (see the output of block 114) , which is the transmitting signal that passes through a frequency down converter. Applicants in the background of invention disclose all the subject matters claimed in claim 6, except for receiving the error compensated data from the step d), comparing the error compensated data and the frequency down converted signal and extracting a non-linear coefficient of each

channel; and linearizing the error compensated data from the step d) by multiplexing the extracted non-linear coefficient of each channel with the error compensated data wherein an updating period of the error compensation coefficient is faster than an updating period of the non-linear coefficient. Posti, in the same filed of endeavor, discloses a linearization method comprising the steps of: receiving an input data signal (see Fig. 7, block 108a, subtractors 202), comparing the input data signal and a frequency down converted signal (see Fig. 4, units 132, 140, and 108) and extracting a non-linear coefficient of each channel (see Fig. 7, the outputs of subtractors); and linearizing the input data by multiplexing the extracted non-linear coefficient of each channel with input data signal (see paragraph 0039). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Applicants' background of invention as suggested by Posti to correct the amplification distortion caused by the amplifier in the transmit path (see paragraphs 0001-0012). Posti does not expressly disclose using the error compensated signal instead of input data signal to generate non-linear coefficients; however since the purpose of using a pre-distorter in transmitter is only to correct the amplification distortion caused by the RF power amplifier, the position (or location) of pre-distorter in the transmitter is a matter of design choice. Therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to combine the teachings of Applicants in the background of invention with Posti's teachings and place the pre-distorter for instance immediately after the error compensator to meet the design requirements of the system. Applicants' background of invention and Posti also do not disclose that an updating period of error compensation

coefficient is faster than an updating period of the nonlinear coefficients (i.e. calculating new non-linear coefficients as described by Posti in paragraph 0050). However, it is a matter of design choice and therefore, it would have been obvious to one of ordinary skill in the art at the time of invention to update one set of coefficients more often than the other set to meet the design requirements and conditions of the communication system.

As to claim 7, Applicants in the background of invention further disclose d-l) generating a digital error compensation signal (see Fig. 1, block 104) to be injected (see block 105 and page 7) to a channel in order to estimates a transfer function of an array transmitting means in the adaptive array antenna system; d-2) generating digital transmitting data by adding the sum data from step c) and the digital error compensation signal from the step d-l (see block 105); d-3) estimating the error compensation coefficient by considering a relation between the frequency down converted signal and the digital error compensation signal (see block 106); and d-4) multiplexing the digital transmitting signal form the step d-2) and a reverse of the error compensation coefficient from the step d-3 (see block 107 and page 1, first paragraph).

As to claims 4 and 10, Applicants in the background of invention disclose that the error compensation coefficient is a transfer function of the array transmitting means (see page 7, lines 32-33).

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to LEILA MALEK whose telephone number is (571)272-8731. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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